

PERCEIVABLE FEEDBACK

CROSS REFERENCE TO RELATED APPLICATION

[0001] The instant application claims priority from provisional application No. 60/984,854, filed Nov. 2, 2007, the disclosure of which is incorporated by reference herein in its entirety.

TECHNICAL FIELD OF THE INVENTION

[0002] The present invention relates to devices provided with touch sensitive arrangements such as a touchscreen or similar. In particular, the present invention relates to an arrangement and a method for providing a tactile or at least a perceivable feedback to users of such devices.

DESCRIPTION OF RELATED ART

[0003] As is well known to those skilled in the art such items as buttons, track balls and/or thumbwheels or similar are commonly provided as an interface between a device and a user of the device—i.e. provided as the user interface or the so-called Man-Machine Interface (MMI). It is also well known that touchscreens are frequently preferred as a user interface in small devices, e.g. in portable communication devices such as cell phones and in other portable devices such as personal digital assistants (PDA) and similar. This is i.e. due to the fact that touch sensitive arrangements such as touchscreens or similar do usually not involve the intricate assemblies and the operational space etc required for implementing mechanical user interfaces such as buttons, track balls and thumb wheels or similar.

[0004] However, although touchscreens have been commonly used in portable devices they do not offer the tactility provided by typical mechanical user interfaces, e.g. provided by those exemplified above. Mechanical interfaces are typically able to provide the user with a feeling that an input has been made, e.g. due to the natural movement of a button or a thumbwheel or similar. Touchscreen systems, on the other hand, are typically limited to provide a visual and/or audible feedback of a successful input to the user. This is often insufficient. For example, a visual-only feedback may substantially increase the possibility of input error resulting in a decreased efficiency of use, whereas audio notification works poorly in noisy environments and may disturb the user or other people who are close by.

[0005] To overcome at least some drawbacks associated with typical touchscreens further developments have provided touchscreens with a tactile feedback. An example of a touchscreen with tactile feedback is disclosed in the patent U.S. Pat. No. 5,977,867 (Blouin) published in Nov. 2, 1999. Blouin discloses a touchscreen provided with a mechanical vibrator for producing a tactile feedback to the user when the touchscreen is touched with a finger. Blouin suggests a motor as the mechanical vibrator.

[0006] However, mechanical vibrators in the form of motors and the like are typically occupying a non-negligible space in a portable device. Moreover, known mechanical vibrators suffer from high power consumption. In addition, mechanical vibrators are static in that they are typically limited to a single tactile response. In addition, known mechanical vibrators or similar comprises parts that are difficult to produce and/or to assemble. Similarly, typical mechanical vibrators or similar requires a fairly complex mounting and/or

connecting procedure. In addition, known mechanical vibrators and the like are typically susceptible to shock, i.e. they are not shockproof.

[0007] Hence, it would be advantageous to have an improved portable device and an improved method for providing a feedback to a user as a response to a touch on a touch sensitive arrangement, whereby at least one of the disadvantages identified above can be mitigated or overcome.

SUMMARY OF THE INVENTION

[0008] The present invention is directed to solving the problem of providing an improved portable device and an improved method for providing a feedback to a user as a response to a touch on a touch sensitive arrangement, whereby at least one of the disadvantages identified above can be mitigated or overcome. Particular aspects of the present invention are intended to solve at least one of the problems of providing a small, low-power, flexible, simple, substantially shockproof actuator for providing a feedback to a user as a response to a touch on a touch sensitive arrangement.

[0009] At least one of the problems identified above is solved according to a first embodiment of the invention directed to a portable device comprising a touch sensitive arrangement comprising a touch-surface arranged to be operatively actuated and to operatively receive touches from a user of the device an actuator arrangement arranged to operatively actuate at least a part of said touch-surface, a control arrangement arranged to operatively detect touches on said touch-surface and to operatively control said actuator to actuate said touch-surface so as to provide a perceivable feedback to the user as a response to a detected touch.

[0010] In particular, said actuator arrangement comprises an electroactive polymer arrangement arranged to be operatively actuated by said control arrangement so as to actuate said touch-surface for providing a perceivable feedback to the user as a response to a detected touch.

[0011] A second embodiment of the invention is directed to a portable device including the features of the first embodiment, and wherein said electroactive polymer arrangement comprises at least one region of an electroactive polymer, and at least a first electrode arrangement and at least a second electrode arrangement that are arranged to operatively actuate said region of said electroactive polymer and to be operatively controlled by said control arrangement.

[0012] A third embodiment of the invention is directed to a portable device including the features of the first or the second embodiment, and wherein said actuator arrangement is attached to said touch-surface for operatively actuating the touch surface so as to provide a perceivable feedback to the user.

[0013] A fourth embodiment of the invention is directed to a portable device including the features of the third embodiment, and wherein said actuator arrangement is attached to a rear surface of said touch-surface or to a side of said touch-surface, so as to be able to operatively actuate the touch surface.

[0014] A fifth embodiment of the invention is directed to a portable device including the features of the first or second embodiment, and wherein said electroactive polymer arrangement comprises at least one region of an electroactive polymer that is formed by said touch-surface.

[0015] A sixth embodiment of the invention is directed to a portable device including the features of the fifth embodi-